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ABSTRACT

An overview of six major issues in computer ethics is provided in this paper: (1) unauthorized and illegal database entry, surveillance and monitoring, and privacy issues; (2) piracy and intellectual property theft; (3) equity and equal access; (4) philosophical implications of artificial intelligence and computer rights; (5) social consequences of robotics and the automated office, human skill obsolescence, and job displacement; and (6) computers as tools of war. Materials and activities which are appropriate for teaching computer ethics at the middle or high school level are described, including readings, arguable premises, movies, case studies, the Eliza software program, data exercises, guidelines/policies, debates, conferences, and content analysis exercises. Two of these strategies--the arguable premise and the case method--are expanded upon for the high school setting, and ways in which computer ethics might fit into the curriculum are discussed. The agenda of a new organization, the Center for Applied Ethics and New Technologies, which provides curricular material on computing technology ethical topics, is also introduced. Seven case studies for classroom use are appended. (MES)

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# Computer Ethics Topics and Teaching Strategies

In the final scene of the movie WarGames, the anthropomorphized computer program called Joshua, learns from its near fatal miss of precipitating a nuclear war and transmits its newly gained heuristic knowledge onto the CRT for the audience to muse over:

"This is a strange game.
The only way to win is not to play."

On a superficial level, this Hollywood morality play suggests to its young "hacker" hero, who initiated the computer war game in the first place after illegally entering the Strategic Air Command computer system, that he would be wiser not to play such deadly games with computers. Yet, somewhere en route to the denouement, responsibility for the "hacker's" illegal and unethical entry into the SAC computer system is shifted to the computer program, who in the true literary tradition of "the machine taking control," forces its own agenda. I find the movie enormously instructive and revealing of the central tensions of any discussion about teaching ethical issues related to computing technologies. These tensions are best framed in the following inquiries:

How can educators encourage the enthusiasm and opportunities for experimentation computing technologies as communication media afford, so that computer skills and learning are taught and developed for beneficial purposes?

How can educators define, typify, and discuss with students the distinctions between ethical and unethical uses of computing technologies?

How can teachers and students frame answers and design solutions to ethical tensions and dilemmas exacerbated by a society in which information and its transmission are increasingly becoming the primary tools for knowledge and power?

Before we examine these questions, I am going to make some assumptions about you, and at the same time create some boundaries for discussion. My remarks assume you are upper and middle school teachers. The emphasis in this presentation is on inquiries and activities which are cognitively and affectively appropriate to these groups. The class in which I use several of these materials consists of juniors and seniors.

Having said that, if any of you teach elementary age children, I would be very interested in learning how particular concepts presented through these inquiries and activities might be altered for use in elementary schools.

Furthermore, I am assuming many of you are responsible for the computer literacy or programming courses at your schools. My responsibilities are different. I teach a course called Applied Ethics, so these materials have been primarily designed to dovetail other units studied in the course, including business, medical, media, military, and sports ethics. An Applied Ethics approach may give you a different perspective in examining these questions and I am hopeful you will find the themes and concepts easily adaptible to your own instructional agenda. I have also anticipated the teaching demands with which you are faced and have examined, for illustrative purposes, the instructional

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content of an eighth grade computer literacy course with an end toward creating smooth entry points for activities and discussions of the type on which this presentation focuses.

Since we do not all use the same text, others among you may have additional suggestions you may want to share at the end of these prepared remarks.

My use of the term computing technologies includes the merging of computers with telecommunications which the French call telematics. This definition considers the computer an information, communication, and transactional medium.

In addition, I am going to concentrate on normative ethical issues in this talk. I am concerned with the ways in which computing technologies are judged by individuals as tools for eliciting behavior deemed ethical or unethical. In ethics, we try to come up with theories of right conduct, so individuals have criteria and guidelines by which to judge their behavior in situations. For this reason, I am not so concerned with computing technologies' effect on society, but with the ways in which their use is judged by reasonable people as right or wrong. Finally, my biggest assumption is that you already perceive a need for computer ethics instruction in the classroom. I am going to start from the premise that computers are a transformational technology. As the computer security expert Donn B. Parker has remarked,

"The need for special ethical considerations in the computer field arises from several unique characteristics of computers and their use. Computers are rapidly becoming the primary repositories of negotiable assets and representations of many other assets in new forms consisting of electronic pulses and magnetic patterns. These assets are not directly subject to manual handling and observation; they can be obtained and used only through technical and automated means. The concentration in computer and data communications systems of vital business information, research and development data, marketing information, personnel and other statistical data or organizations has created a [new] power base..."

Computers are a transformational technology because they are changing the way society acquires knowledge, exchanges information, does business, and spends some of its leisure time. Furthermore, some believe the computer is a marginal technology. Dr. Sherry Turkle, a psychologist at MIT has noted in her book <u>The Second Self</u>,

"...the computer is a new kind of object-psychological, yet a thing. Marginal objects, objects with no clear place, play important roles. On the line between categories, they draw attention to how we have drawn lines. Sometimes, in doing so they incite us to reaffirm the lines, sometimes, to call them into question, stimulating different distinctions. They are the growing point for new learning, new theory building. Computers, as marginal objects on the boundary between the physical and the psychological, force thinking about matter, life, and mind...Marginal objects are not neutral presences. They upset us because they have no home and because they often touch on highly charged issues of transition."

Computers, as a transformational and marginal technology, thus produce ambivalence, anxiety, and uncertainty in thought and behavior, just as the introduction of the telescope challenged the adequacy of man's senses to reveal reality, and the advent of gene splicing and recombinant DNA techniques have disrupted our traditional understanding of life.

Assuming these introductory remarks have set the stage, I will proceed to outline the direction of this presentation, whose end is twofold:

- to supply you an overview of the major issues in computer ethics today; and
- to provide you some teaching strategies for effectively disseminating information about computer ethics.

Consequently, I will spend a few minutes defining questions to which a teacher considering a computer ethics unit should respond before incorporating such a unit into a course. These focus primarily on instructional objectives.

Then I will move to a description of six major issues in computer ethics. Next, I will outline seven teaching strategies that can be used in the high school classroom and eight that potentially could be meshed into a middle school setting.

Then I will elaborate on two of the strategies I have found successful in the high school; next providing middle school teachers responsible for literacy or programming classes some recommendations for combining computer ethics topics with components in their standard curriculum.

Finally, I will briefly mention the work of the Center for Applied Ethics and New Technologies whose charge is to furnish innovative instructional resources to educators and students who wish to initiate and sustain the dialogue on computer ethics topics.

To assume efficacious results in integrating a computer ethics unit into a course, it is best to first establish instructional goals. These can range from very specific tangible objectives which can be measured, to broad intangible goals which are not as amenable to quantitative assessment.

For example, you may have the specific goal of informing students of the school's software copying policy or to relate to students the consequences to business and to other organizations of illegal database entry into confidential computer files.

Alternatively, you may have a broader goal as I do, of getting students to recognize that they live in a web of moral relationships and that personal choices, in this instance computer-using behaviors, have an effect on others as well as themselves which can be beneficial or harmful, and to encourage them to establish criteria enabling them to distinguish among uses.

The goals for the unit drive the other questions, three of which I have listed here. If I have determined that I want to tell my students about the school's software policy-

how might I go about that, given the materials I have at my disposal, e.g., reading, movies [what materials do I have available? and how much time do I have to spend?]

in a manner that will be most valuable for the audience [who is the audience? and what has worked best with them?]

and which elicits relevant feedback which in turn can be evaluated to fine tune the unit. [what testing mechanisms are at once valuable to the students and to me?]

Since the goals of my unit integrate both factual and connective knowledge in the sense that the facts, in this case, computer ethics lessons are presented and students are encouraged to assign values and meaning to these facts so they

can make sound judgments when faced with future choices, I generally begin with an overview of the substantive issues in computer ethics.

Six of these issues are listed here which I will now briefly describe through a summary of the themes posed by each issue or through example.

#1 Unauthorized and illegal database entry, surveillance and monitoring, and privacy issues.

This is the umbrella issue of computer ethics. It includes an introduction to the "hacker," that legendary adolescent [usually male] who knows he has free rein of the phone lines until he is 18 and therefore makes full use of his consummate knowledge of computers to break into as many proprietary systems as possible, because in his words "like Mt. Everest, they are there, and I am curious."

Generally, I point out to students that the hacker, though real and doing a land office business in credit card fraud [$200 million] and software piracy [$100 million], is less important according to most security experts than the internal computer using employee who embezzles, tampers, extorts, and steals for purposes more malicious than curiosity.

Because companies do not reveal the extent of their losses, it is difficult to speculate the amount of pecuniary and other damage done by unauthorized database entry. Though investigators provide only anecdotal evidence of amounts involved, it is safe to say millions are potentially at stake if totalled. One security expert wrote in a "Wall Street Journal" article in early 1986 that one of his clients, an insurance company, lost $38.1 million to a senior officer proficient with computers. The most interesting twist is that the company never reported the crime to the police. This is most often the case, especially the larger the amount.

This issue also includes the potential surveillance and monitoring capabilities of the new electronic technologies, the prime examples of which include the controversial computer matching and profiling programs of the federal government begun in the Carter Administration and spread to the states in the Reagan Administration. Similarly, this issue includes the increasing use by the private sector of electronic devices to monitor employee productivity, the most common examples: the trucking industry speed monitoring devices and food retailing's use of Universal Product coding.

Clearly, the privacy issue is related to the apprehension over surveillance. The advent of large storage capabilities, communication networks, and the increase in accessibility to massive databanks so that the average person, according to "U.S. News & World Report," can expect to have approximately 39 public and 40 private sector databases with his/her name in them, place privacy in a new relation to these techniques and make the flurry of privacy legislation over the past decade more explicable and compelling.

#2 Piracy and intellectual property theft.

This is the problem with which we are probably most familiar. Sides on this issue, until recently have been clearly drawn. In business, the two trade organizations for software developers and distributors, ADAPSO and Software Publishers Association, have publicized their viewpoints in the media and have given their words force by instituting legal proceedings against companies who have openly violated the copyright laws.

Simultaneously, educators have maintained economic considerations prevent them from adhering to what some regard as unfair copying regulations imposed by a greedy and arrogant industry. Teachers have been sometimes accused of operating "copying sweatshops" and "pirate houses."

Indeed, some educators are outraged that the profit motive appears to supersede the acquisition of learning. They believe it the right of each student to get the best education possible with the most efficacious technologies available to the society itself.

All of us have perhaps encountered the emotional fury of this debate. We may have been in uncomfortable situations; we also know that copyright infringement is going on. Last year, a student of mine, Rick Alonzo, did a study of software piracy at our school. Of the 360 students in the school, 249 claimed to be routine computer users. Only 2 of those students who were computer users did not pirate software; one because he worked for a software company and the other because his father wrote software. Largely as a result of this kind of evidence that includes not only students but consumers nationwide, the software publishing industry has temporarily retreated from its high profile strategy of instigating lawsuits against corporate piracies. Lotus Development Corporation and Ashton-Tate, Inc., two of the biggest publishers, announced last fall an end to copy protections for trustworthy corporate and federal government clients who were also enforcing strict antipiracy policies. If we assume that even with a loss estimated in 1985 between $600-$800 million annually to piracy and that such companies are not going bankrupt because of it, then we can expect them to extend this policy en masse to other trustworthy institutions with similar antipiracy policies, including school systems. Clearly, policies toward software copying are needed. As educators, we might consider the wisdom of the wedge argument that disrespect for one law, such as the copyright law, fosters disregard for other laws and encourages vigilante solutions. We also know, however, the topic goes beyond tangible theft of a program to the more intangible problem and prospects of idea ownership.

One of the most perplexing classroom problems is that of making distinctions that are meaningful. Students know, for example, that writing book reports or essays is an individual pursuit; if it is collective then those who are responsible for parts of the whole are credited.

Computer technologies pose similar issues, but with a slightly different twist. A certain type of copying in computing is legitimate. If students are learning particular programs, they often share their solutions, or to take Logo design exercises as an example, students build on each others' work.

In so doing, they begin to make connections that may be fuzzy but provocative.

"Why is it I can't copy another's book report but I can use, i.e., copy, another's program?"

"Or why is it that I can't look over someone's shoulder when he/she is writing an essay but can do it when another classmate is creating a new program?"

Does the teacher explain it as a difference in circumstances? One is an exercise and the other is a test? Is it the distinction between copying and use that makes the difference?

Such questions challenge us about the differences between having an idea and expressing it; they touch on originality and creativity, ask us what the nature of knowledge is and define what methods of pursuing knowledge are and are not permissible.

#3 Equity and equal access.

The debate impacts the school system in two ways: first as a class and race factor and second as a gender dilemma.

Of several studies that have been conducted within the last few years, most have found telling differences among wealthy and poor schools with respect to availability and access.

For example, in a 1983 study prepared by the National Assessment for Education Progress, only 15 percent of 13 year olds from rural and urban schools reported using computers. Thirty percent--or twice as many--of their peers in richer urban and suburban schools were computer users. In general, the research reveals significantly different numbers of computers, amount of hands-on experience, type and scope of source offerings, quality of instruction, and availability of home computers. The gender gap has also been well documented. Studies describing sex segregation in the computing industry labor force are reflected in the school computer experience of girls: the informal and formal organizations created by boys to gain computer expertise and their outnumbering of girls by 2 to 1 in programming courses enable them to prepare early on for the prestigious and high paying jobs as computer scientists and engineers, who are 95 percent white male according to a 1984 study. Girls, on the other hand, excluded from the "old boy networking" taking place in school computer rooms, camps, and at home are preparing for the low status and low paying "pink collar ghetto" of word processing and data entry positions, 71 percent of whom are white women according to the same study.

While justice is the goal of this issue, rights and control are the main discussion topics. The principal questions are these: should everyone have a right to computer access in the U.S., just as we have recently and grudgingly accorded everyone the right to health care? Who shall control computer access and under what conditions?

While we realize these problems exist in our own computer rooms, they also have global implications. Who are the have and have not computing technology countries? Do not risk creating "technology czars" and "techno-peasants" in a world increasingly dependent on information as a source of power?

#4 Philosophical implications of artificial intelligence and "computer rights."

Irrespective of the outrageousness of the implications of "computer rights," the fact is that intelligences other than human and which are artificial, are on the way. Computing technologies in the form of robots and machines that think in turn make us think about the uniqueness of humans and our place in the cosmos. Indeed, Geoff Smith of the National Computing Centre has written,

"Computers force us to re-examine what is meant by many of the adjectives traditionally applied to humans, including consciousness, intelligent, perceptive, free, and aware. At one level we may even speculate on what it means to be alive. There is a consensus that intelligence, defined in some way, can be artificial. Can life be artificial? In what circumstances would we recognize a computer as alive?"

This question is the most challenging but the one to which least consideration is given, for the simple reason that it seems too science fiction-like and has less immediate relevance to our lives. Indeed, I have found that it should not be even mentioned unless there are intentions to treat it as a serious topic worthy of examination and analysis, and unless the teacher connects it to other examples that may have more immediate credence, such as fetal rights or animal rights.

#5 Social consequences of robotics and the automated office; human skill obsolescence and job displacement.

This issue has received the most attention from scholars, especially economists, who have taken a range of positions with respect to the long-term employment consequences resulting from increasing automation in the manufacturing and office settings. As it was difficult to determine the amount of money lost from illegal database entry, so too it is hard to glean how much job displacement [which may not necessarily lead to unemployment] will occur in the robot factory and automated office.

According to Roger Draper, who conducted an extensive robotics literature review, "specific predictions prove nothing because they fail to distinguish between what is technically possible and economically rational," which from his vantage point warns that as yet us no one has shown that such technologies will add jobs to the economy nor has anyone yet been able to validly claim that robots will liberate humanity from hazardous and demeaning work.

While optimists use historical example, such as the internal combustion engine to show that these technologies will probably create employment, and simultaneously draw up the new service jobs now coming into existence to offset potential employment, pessimists remind us that robots can produce dross as well as gold. They counter opponents' claims by warning against facile analyzing when conditions today are fundamentally different than in the past, and point to the tenuous existence of service industry jobs by fearfully acknowledging the impact of automation on white-collar workers who stand to lose just as much as the members of the manufacturing work force, with the pervasive use of such technologies.

Similar to the first issue, this issue integrates components of others; it touches on equity in society; it acknowledges the struggle for control in the workplace between management and labor, exemplified through productivity monitoring, and it reveals some of the uses to which artificially intelligent machines will be put in the future.

#6 Computers as tools of war.

This issue is one which the public always mentions as a major concern, but which few actually study except at universities which have strong technology and society programs. Furthermore, it brings with it additional emotional and intellectual baggage in the form of one's view toward war in general.

For classroom purposes, much like the artificial intelligence issue to which it is related, it is often difficult to link to the standard curriculum. Nevertheless, I introduce it to highlight the controversy between individuals who maintain the moral neutrality of tools, such as computing technologies, and those who maintain that human tools express and even indicate certain values and are therefore not morally neutral.

For example, some defense experts maintain that extensive use of simulations and models in the form of war games by U.S. military personnel encourages distorted tactical and strategic thinking about real war time predicaments and fosters the belief that a limited nuclear war is both feasible and winnable. According to these war games critics, the simulations reinforce "the cult of speed" already inherent in computing technologies, because engagements are always quick and split second decisions are required on the basis of a few variables simplified to fulfill program demands.

In addition, computerized weapons systems, such as precision or "smart bombs," provoke in a very elemental way the extent to which humans are able to sustain control of their machines. They also emphasize the fears centering around increased reliance on computers and the accompanying risks this dependence entails when a system is disabled or sabotaged.

These dependence fears are not wholly exaggerated if one remembers that in the Carter Administration during a two-month time span, three false alarms signalling a massive Soviet attack, started a missle launching countdown. Later investigation revealed that computer malfunctions, including a faulty integrated circuit chip, triggered the alarm.

At the same time, computer terrorism, though not yet a problem in the U.S., has gained "manifesto status" among radical groups in Italy and France. From 1978-1982, terrorist groups claimed responsibility for over two dozen computer facility bombings. The more ominous danger, however, could occur when a trusted employee turns "mole" and creates havoc in Pentagon computers through the planting of "logic bombs." For example, it is conceivable and worthy of a James Bond movie script, that an interloper might program a "Trojan horse," a secret instruction which triggers under special circumstances, to retarget missiles to hit neutral or friendly parties, a scenario Air Force Colonel Roger Schell, NSA expert in security, is fond of sketching.

Clearly, as the U.S. continues to build its "smart missile" arsenal and debates the wisdom of SDI, the issue of vulnerability is more likely to move from movie script or war game to reality.

An assessment of the issues in an organized fashion more easily enables one to find materials and activities that will adequately serve as springboards for factual understanding and analytical discussion. I will turn to these materials and activities now.

Readings

The Rise of the Computer State by David Burnham
"Would an Intelligent Computer Have A Right to Life?" Robert Mueller

Rise

This book is an exaggerated and one-sided portrayal of the effects of the use of computing technologies on human ends and values. Burnham's major thesis is that the advent of massive electronic databanks erodes personal privacy and creates conditions for abuse of power by a small group of elite technocrats. This book is effective as a teaching tool because it evokes strong student reaction. Because of its one-sidedness, students attempt to garner opposing arguments, in the process, fashion a more objective, detailed, and unbiased appraisal of computing technologies' effects on ends and values. This allows the response to become their own. At the beginning of a unit, I have found exaggerated or extreme visions more effective than the presentation of balanced accounts, for the reason that either-or positions tend to encourage active rather than passive learning.

"Would an Intelligent Computer Have A Right To Life?"

This reading examines the notion of machine consciousness from two ends of a spectrum. On one end, are those who argue it is possible for a machine to be conscious, and on the other end are those who claim a machine can be no more than a mechanized "idiot savant."

This reading is primarily used as a "teaser" to get students to think about two issues: the uniqueness/nonuniqueness of human beings and the potential assignment of moral status to nonhuman beings and animals which takes the form of according rights.

This reading is properly the sphere of an ethics course and may be less pertinent to a programming or literacy course unless such a course includes a discussion of fifth generation computers, expert systems, and artificial intelligence concepts.

Arguable Premises

Arguable premises represent broad value-laden statements that can be argued from several sides in a discussion environment. To be most effective, such premises generally take a position on the subject in question. It is also useful to have some of the premises suggest negative and others positive consequences, in this case involving the use of computing technologies.

Since I am going to demonstrate the use of arguable premises in a moment, I'll move to the other strategies quickly.

Movies

The two movies I have found efficacious as springboards for discussion are "WarGames" and "2001." "WarGames" illustrates five of the six issues in computer ethics, the exception being social issues provoked by job displacement.

"2001" offers a vivid snapshot of the prospects of computer rights and the issue of artificial intelligence through the introduction of HAL. In addition to HAL, one might also mention R2D2 and the droids from "Star Wars," all worthy of a discussion about their moral status and value as "conscious" beings.

Cases

Individual cases which represent components of or a combination of the issues are a very efficacious way to introduce topics in computer ethics. The case method easily provokes discussion, because students find it easier to take perspectives if they have a narrative from which to draw and which unconsciously puts them into the position of one of the parties in the case. Additionally, they enjoy giving advice and telling others what they would do in a given situation. Cases are more realistic and less abstract than arguable premises. In this sense, they parallel the springboard effect of movies, which are also narratives. Happily, cases are more relevant to an issue one is studying than are movies which must meet extraneous Hollywood objectives. I am going to demonstrate the use of cases more precisely in a few minutes, so I'll defer additional commentary.

Eliza Program

The Eliza program refers to a software program the MIT computer scientist Joseph Weizenbaum created in the 1960s which incorporates early artificial intelligence processing techniques. Weizenbaum intended it as a computer parody of the Rogerian psychotherapeutic method of mirroring.

To others the program represented another computer potential: that of taking on the traditionally exclusive human abilities of understanding and empathy. To Weizenbaum's horror the program came to be perceived by many as a viable alternative to human interaction in counselling situations.

In running the program, students are confronted with a machine that seemingly "understands" what is being input. For students, the program Eliza serves to broach the question of what it is to be human, through its demonstration of "thinking."

At the same time, Eliza serves to review the privacy issue. One of the most striking facts about running the program is that students, who usually gather around the computer in groups, choose to operate the program alone. Discussion can thus ensue concerning the type of information input into Eliza that would be considered private and the potential problems in trying to protect that information in computer networks.

Data Exercises

A data exercise is a strategy that requires students to be able to use a commercial graphing program such as PFS: Graph or to create a program that makes such graphs. I use data exercises to illustrate one issue: the potential effects of robotics on job prospects.

A list of numbers which represent employment projections for a period of five years are circulated for the state of Michigan and the U.S. These numbers are inpute via PFS: Graph or any other graphing program and transformed into bar or line graphs for the students to examine and discuss. The display of quantitative information, especially if one side is initially introduced, is effective as a springboard, because it gets students to think about the limits of the data and the need for additional data that would make the projections more precise and accurate as indicators used in defining a social problem.

Guidelines/Policies

This strategy represents a feedback and testing tool for the unit. Students are given an essay assignment that enables them to take the knowledge they have gained through reading and activities and put it to use to solve a practical problem through guideline setting.

I sometimes request that students compose or design a public policy or a school policy for disk copying that has certain attributes, such as it has to be equitable, fair, and practically feasible. One might also announce that the policy which best fulfills these criteria will be the one used in your classroom in the future.

Feedback assignments such as those mentioned should enable the teacher to evaluate which strategies are most compelling and yield the most accurate factual results or thoughtful standards/guidelines, depending on the goals one has outlined for the unit.

The major difference between middle and high school strategies involves the type of information being presented, the amount of information, and the depth of analysis. The readings for middle school are descriptive, factually focused, and introductory. For example, the reading for middle school includes magazine and newspaper articles on illegal database entry, piracy, hardware theft, or computer fraud. These articles tend to furnish definitions and terms so students are afforded a firm factual foundation.

The movie "WarGames" is also appropriate for middle school students and can be used in the same way it is in high school, as a springboard for discussion of the issues. In the middle school setting, however, I would tend to emphasize the piracy, illegal database entry, equal access, and robotics issues and downplay artificial intelligence, because it may not yield as rich an analytical discussion. Similarly, the same data exercise, especially if it is part of a programming course, is also applicable. I suspect this reveals my high school bias and an attitude toward seventh graders. Though when I did teach seventh and ninth graders in different subject matters, I found their enthusiasm contagious, and there are several activities I would merely adapt to the subject of computer ethics.

A debate is particularly fruitful for ninth graders. The class, based on member's choice, is split into two groups to represent two opposing views on an issue such as software piracy. One group takes the position of the software publishing industry, while the other takes the position of consumer. Both sides read articles and conduct interviews to research their given positions.

A modified debate structure is used, whereby classmates choose different individuals to present or respond to different arguments. The teacher serves as referee and determines who has won on the basis of a predetermined set of criteria.

A conference on "Computer Industry Social Issues" might be effective with seventh or eighth graders, though it is more elaborate and takes more preparation than a debate. A conference assumes students will be role-playing. For example, the teacher might instruct students to portray "Computer Security Experts" or "Former Hackers." The role determines the student's assignment for the conference. Each is instructed to gather information on his/her career or role in order to give a portrayal, present specific findings, or a particular perspective at the conference.

In the past, I have found conferences a useful vehicle for disseminating factual information in a creative and memorable manner.

Content analysis is a sophisticated way of assigning students an observational acuity test. An article on computer ethics written by William Kreidler in 1984, suggested having students bring magazines to school for two purposes: to cut out advertisements of people in different work environments and to count the number highlighting people working with computers.

The first was designed to get students to think about different types of jobs that ultimately could be automatized and the latter was to determine the ethnic and gender focus of computer advertisements in order to speculate about its reflection of the society at large.

I have used content analysis exercises before in other contexts and have found them excellent for discussion, especially at younger ages.

Feedback in the middle school can include assignments to students of a series of writing activities which allow the teacher to assess the extent to which students have understood and are thus able to describe the substantive content of computer ethics.

For example, after the data exercise, the teacher might ask students to summarize the findings the graphed data reveal. Alternatively, they might be asked after the debate on software piracy, who they think should win the debate and for what reasons.

The difference between the middle and the high school feedback strategies is one of pacing and depth. I would give a large number of factual and stepped assignments to younger students and a few connective knowledge and comprehensive assignments to the older ones.

With a general overview of these teaching strategies, I would now like to expand on two of them geared to the high school classroom: the arguable premise and the case method.

The arguable premise strategy is particularly useful if students have already begun assigned reading or have some familiarity with the issues in computer ethics. The case method is effective at the beginning of a unit when the teacher is initially trying to formulate the issues.

In the premise strategy, a statement that is broad, vague, and controversial is written on the board. In short, the statements are premises the class can argue over. Six possible premises are listed. I will follow through the strategy on the first one.

Once everyone understands each term in the statement, students then begin to think of evidence or findings which favor or corroborate the truth of the statement and alternatively evidence which doesn't favor the truth of the premise. These are listed on the board and evaluated.

The value of the arguable premise strategy is that it allows students themselves to determine and assess the evidence, and subsequently make their own choices, given the weight of evidence. It allows the teacher to guide the discussion, often by summarizing points or giving additional examples, while encouraging students to take the initiative in idea construction.

The case method has some additional advantages: it encourages empathy and detached role-playing; it reinforces some adolescents' fascination with testing out new opinions and roles in a nonthreatening way; it serves as an excellent "tickler" for formulating and defining issues of significance, and finally, it is one of the best ways I have found to get students into the habit of making distinctions, practicing comparative analysis and clarifying contradictory thinking.

The seven cases I have provided are generally handed out together, though we treat them separately. The steps I usually follow in using the case method are listed.

First, a student summarizes the facts. Case #7 centers around a controversial policy in a school which prohibits students from using word processing programs to accomplish homework. A straw poll is taken on the major issue presented. For example, the teacher might ask how many think the word processing policy is fair? A straw poll allows the teacher to ask why the student feels as he/she does, which initiates discussion.

Similar to the arguable premise strategy, the teacher writes or keeps a running account of reasons; in this case either for or against the word processing policy, so students can see the results of discussion at the end of class.

Once the arguments have been exhausted or an impasse has occurred, the teacher summarizes and moves to the next case, following a similar procedure for the next case. When all cases have been discussed, students are instructed to compare case similarities and differences. These too should be written on the board. Then the teacher asks the students to place the cases on a harm continuum where one end signifies the most harmful consequences to the society or to individuals and the other represents the least harmful consequences.

Placement of the cases on the harm continuum encourages students to refine their initial emotional reaction to the cases, to change their minds if they wish because the cases were introduced in a different context, and most importantly, to facilitate the formulation of important distinctions for subsequent guideline creation. For some cases, students are unable to come up with guidelines for use in prospective situations, because they claim that "Each case should be looked at on its own merits." However, there are some for which they generally agree on guidelines or rules to follow, if faced with similar situations in the future. For example, all agree that Case #4 demands the rule that "stealing should be prohibited," because of the harm it does to individuals and to society. Subsequently, they also realize Case #3 represents stealing, so they acknowledge the need to apply the rule in this case as well.

I use both the arguable premise and case strategies at the high school level routinely. Both take at least a week of class time, and if one is going to use all the arguable premises at least two and a half weeks will be consumed. Consequently, the teacher has to pick and choose. It is also important to remember that I teach computer ethics unit as part of an ethics course so these topics are tailor-made.

Since most high and middle schools do not teach an Applied Ethics course but are more likely to include computer literacy and programming courses, my next comments are directed to adapting some of the strategies discussed to an eighth grade computer literacy course.

The book we use at our school, called Spotlight on Computer Literacy by Ellen Richman, includes a chapter on computer misuse so the text itself opens the way for a brief discussion of some of the issues previously outlined. This might be sufficient for some. The teacher of this course and I have worked out what we call entry points for discussion and that allow her to finish her required instructional agenda as well as enrich it with some of the materials we use in the computer ethics unit in Applied Ethics.

Based on the exercises and assignments in the book, we have defined four entry points for computer ethics discussions.

In the basic procedures unit, students learn disk copying. At this juncture, the teacher introduces the school's software piracy policy as well as current copyright laws and talks about the heavy financial losses sustained by the software industry by citing figures from trade organization studies. Likewise, the teacher also ascertains the opinions of students on piracy.

Piracy as an issue is reiterated during programming exercises after the most difficult programming assignment (usually a computer graphics design) is completed by students, at which time the teacher asks students whether they might regard piracy differently if the program they just finished were traded among friends without their (the authors') knowledge and without giving credit, or if the expression of this idea were actually stolen by a classmate who used it and received credit and an "A" from the teacher.

Another programming exercise serving as an entry point is one in which the assigned program includes information such as name, age, favorite color and other information revealing about the self. During this exercise, the teacher asks students what information they consider private and confidential.

The teacher provides students factual information about the number of databases containing personal information on the average individual. Together the class comes up with a list of problems that might result were private information to be made public or easily accessible to almost anyone. The teacher also asks students what they might do if a teacher were to gain illegal entry into one of their personal files, leaving a "logic bomb" behind or destroying part of it.

In the computer as a tool section of the course, students can complete the data exercise previously mentioned, which will introduce them to the robotics issue. This is also an appropriate time to discuss the equity issue presented in Case #7 concerning a school's policy toward word processing, since word processing programs are generally mentioned in this section.

In addition, introduction to database management, electronic spreadsheets, and communications programs serve to reiterate and supplement introductory information given on the privacy and illegal database entry issue.

The chapter outlining the history and contemporary uses of the computer offers the teacher a convenient way to illustrate the potential problems caused by increased monitoring and surveillance capabilities. The chapter includes a discussion of the uses of computers in supermarkets and in manufacturing. The teacher can supplement the chapter commentary by citing the possible loss of control consequences of automation. Furthermore, this chapter facilitates discussion of the risks of a too heavy reliance on computers and the vulnerability to societies whose dependence becomes extreme.

Finally, the history section in the chapter opens up a possible discussion of fifth generation computers and thinking machines allowing the teacher to touch on the ramifications of artificial intelligence.

I began this presentation by remarking that one of the greatest challenges facing computer educators is ensuring the new freedom and opportunities afforded by computing technologies are used equitably and reap beneficial consequences.

The least favored outcome we want to occur is the message suggested in "WarGames" that the only way to win the game is not to play. A unit on computer ethics need not be alarmist or neo-Luddite in tone.

I have tried to show it is possible to engage students in a dialogue about ethical issues related to computing that is balanced and encourages students to sustain their philosophical conversations outside the classroom.

At the same time, it is important that computer educators continue this dialogue. For this reason, I would like to briefly mention an organization which seeks to systematically and routinely provide curricular material, on computing technology ethical topics, some prototypes of which I have shown you today. The nonprofit, nondenominational, and nonpartisan Center for Applied Ethics and New Technologies has been established to accomplish four primary goals:

Toward this end our current agenda includes:

- taking a snapshot or profile of what educators nationwide are presently offering in courses on the topic of computer ethics via a survey instrument;
- establishing a library of resources on the subject of ethical and social issues related to computing which will be available electronically as well as in hard copy;
- editing a casebook that can be used by computer educators as supplemental material accompanying texts;
- conducting teacher and student workshops designed to provide content and research opportunities and to initiate networks of individuals interested in the subject;
- sponsoring professional symposia for educators, philosophers, and industry leaders on important research topics; and
- sponsoring and maintaining a computer conference which enables educators and students around the country to use the computer to discuss important information and to exchange ideas on the subject.

This agenda is now underway. We hope our plan combines what people do best, with what computing technologies do best, because I have always been struck by a student comment on the Eliza program this year: "I found it unsettling and eerie to use the program. I kept thinking about the prospects of turning to computers for "right" answers to ethical problems rather than turning to each other."

## Computer Ethics Cases

### Case #1

In November, you took the Scholastic Aptitude Test as part of the college admissions process. About three months after taking the test you receive the following letter:

"Dear _____:

Each year the ETS, which designs and administers the SAT, conducts a statistical evaluation of answers marked by students taking the test at the same center. Statistical review of your SAT answer results from November has shown close agreement with those on another answer sheet. Such agreement is unusual and suggests that copying has occurred.

For this reason, ETS is requesting that you provide additional information so that the service is able to forward test results to the colleges you have selected. If information is not received within two weeks of receipt of this letter, the service will cancel your scores and notify the appropriate colleges."

This incident occurred in 1982, when ETS sent out form letters to 2,000 students around the country in an effort to discover cheating. To obtain the necessary information to make such an allegation, ETS used: computer matching, a technique in which answers on different tests are compared; and computer profiling, in which disparate clues are used to assess whether a person fits a model of known or suspected violators.

1. Are there any ethical issues in this case? If so, what are they? If not, why?

2. What are the different perspectives one can take on the ethical issues presented in this case? For example, how might ETS justify its action? How might a student defend himself/herself?

3. Can you think of other examples which present similar problems?

Case #2

The fast food franchise for which you are a part-time delivery person has recently installed an electronic monitoring device in each of its delivery cars in order to increase productivity and decrease costs for car maintenance. Your supervisor uses the device to monitor speeding and unnecessary stops. If the computer printout generated from the sensor records three speed limit infractions (over 40 MPH in city limits and over 55 MPH on expressways), drivers receive an official reprimand. If a speed limit infraction occurs after the reprimand, the driver is suspended for a week without pay. After that, the driver is fired. If, however, the driver remains under the speed limit he/she receives 3¢ a mile for each trip made without breaking the speed limit.

1. Do you recognize any ethical issues in this practice? If so, what are they? If not, why?

2. What are the arguments for monitoring productivity using electronic means? What are the arguments against it?

3. Do you foresee an increase in monitoring and surveillance activities? Why or why not? Can legal protection against monitoring keep pace with technology?

4. Can you think of some more common examples of monitoring and surveillance?

Case #3

You are a junior in high school and have a reputation as a "computer wizard." Your social circle comprises other "computer wizards." For several months, you and your friends have been sponsoring a "bulletin board," courtesy of the school's telecommunications system. On this "bulletin board" participants have been discussing the LISP programming language. The "LISP bulletin board" is not a "hacker tool." It does not include free access suggestions or advice on violating the copyright laws applicable to software. School officials, however, do not know about your use of the school's system for this purpose.

1. What are the ethical issues involved in this case, if there are any?

2. What would the school's position be on the use of the school's system for this purpose? Can the students justify their use of the system in this manner?

Case #4

Last year, Washington Elementary School purchased ten Apple IIe microcomputers for classroom use. Your brother attends the school and he and his friends enjoy using them for art projects and for problem-solving purposes.

You are the "computer wizard" introduced in Case #3. At school you happen to overhear two boys (younger than you) planning to meet at the elementary school that evening. You do not know the boys very well, though you know from other sources that they are "hackers."

The next day your brother comes home from school and reports that eight of the Apple IIes have been stolen. He says that several of his classmates cried when they learned the computers were gone. You sympathize with your brother and tell him you hope the thiefs are caught and punished.

1. Do you report what you know about the two boys?

2. Is there a ethical difference between the issues presented in this case and in case #3? How can the "computer wizard" justify his unauthorized use of the school's computer system, if he condemns the theft of the computers from his brother's elementary school?

Case #5

Joe, a high school student has several copies of popular computer games, including Frogger. His friend Louise wants a copy of Frogger so she can play the game on her own computer. Louise has often given Joe programs she has collected.

Francie knows Joe from Computer Club. Louise is her best friend. She overhears Louise ask Joe to make a copy of Frogger. Francie knows the person who developed Frogger. He spent several hundred hours creating it. Furthermore, Francie knows his income is dependent on the royalties received from the sales of Frogger. Likewise, she went to a Computer Club meeting where a former student of the school (now in law school) gave a presentation on violations of copyrighted software in the private domain. Joe and Louise also attended that meeting.

1. What are the copyright laws to which the law student would have referred? Describe them.

2. Are these laws adequate? Do you agree with them? Why or why not? What are the consequences if you break them?

If you believe them inadequate, is it possible to change them? What would a model copyright law include?

3. What values are in conflict in this case? How can they be resolved?

Case #6

Ms. Leppern, a computer teacher at Van Buren High School, is scheduled for leave next year. She has taught Pascal (a programming language) for the past three years in a computer lab equipped with ten microcomputers and three Pascal language systems. Since Pascal is disk-dependent, she has made several additional copies of Pascal so all ten computers can be used during class. She wants every student to have as much hands-on experience as possible. Mr. Faclin, another teacher in the department, will be teaching the class next year, and does not want to use the copied disks. He expresses his concern over the copying of these disks to the chair of the department, Mrs. Likert.

Mrs. Likert suggests the teachers meet with the principal, Mrs. Thompson, to discuss the matter. Mrs. Thompson knows the school cannot afford to purchase additional software. At the same time, district policy forbids the copying of commercial disks.

Note: Cases 5 and 6 were excerpted from: "Ethics and Computer Use," by Kay Gilliland and Mattye Pollard, The Computing Teacher, August/September, 1984.

1. Who should receive primary responsibility for unethical action in this case? Why?

2. Is this an instance of a system or institution creating incentives for unethical behavior? Why or why not? Can you think of other examples similar to this case? How are they similar? How do they differ?

Case #7

Ms. Garcia, the school principal, was preparing for a discussion on the district's word processing policy with the faculty. She had been told by her supervisor to reaffirm the policy stating that "no major assignments are to be done with the aid of microcomputer word processing programs." Ms. Garcia was also aware the policy was controversial with faculty members, students, and parents. Already, one student had refused to comply with the policy and had received a failing grade on a term paper written on a word processor. The student was challenging the policy and had appealed to Ms. Garcia.

Ms. Garcia knew it was her duty as principal to enforce the policy even though she was personally undecided about its fairness. She felt sorry a student at her school was getting an "F" based on a policy even the school board had declared "interim," while they studied the issue further.

Note: This case is taken from: "A Question of Ethics," by Larry S. Hannah and Charles B. Matus, The Computing Teacher, August/September, 1984.

1. Do you think the policy fair? Should students who have a computer at home have an advantage over those who do not? Justify your position.

2. Suppose Ms. Garcia does not agree with the policy and feels strongly about it. Should she enforce it? Why or why not? What are the conflicting obligations this case presents for Ms. Garcia?

3. Do the issues in this case resemble any other cases? If so, which cases? If not, how does this case differ?